

REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Official Action dated September 8, 2005. In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due consideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

Claims 1-20 are under consideration in this application. Claims 1-20 are being amended, as set forth in the above marked-up presentation of the claim amendments, in order to more particularly define and distinctly claim applicant's invention.

Additional Amendments

The specification and the claims are being amended to correct formal errors and/or to better recite or describe the features of the present invention as claimed. All the amendments to the specification and the claims are supported by the specification. Applicant hereby submits that no new matter is being introduced into the application through the submission of this response.

Formality Rejection

The Title of the Invention was objected to as being non-descriptive and has requested a new title. Furthermore, the disclosure was objected to due to some informalities and has requested a substitute specification. Claims 1-20 were objected to for a plurality of informalities, and claims 4-5 and 14-15 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

As indicated, the specification and the claims are being amended as required by the Examiner, except submitting a substitute specification. Instead, "a first logical volume to the upper device" is being defined to be interchangeable with "a host volume" or "a upper logical volume"), and a second logical volume is being defined to be interchangeable with "an inner logical volume" in the specification. In addition, "the first logical volume" is being amended into "the first upper logical volume", "the logical volume for control" is being amended into "the second upper logical volume", "the second logical volume" is being amended into "the first inner logical volume", and "the other second logical volume" is being amended into "the second inner logical volume" in the claims.

Accordingly, the withdrawal of the outstanding informality rejection is in order, and is therefore respectfully solicited.

Allowed Subject Matter

Claims 6-7 and 16-17 would be allowed if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Prior Art Rejections

Claims 1 and 11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over US Pat. App. Pub. No. 2003/0126327 of Pesola et al. (hereinafter “Pesola”) in view of US Patent No. 6,725,331 to Kedem (hereinafter “Kedem”), and claims 2-3, 8-10, 12-13 and 18-20 over were rejected over Pesola in view of Kedem, and further in view of US Pat. App. Pub. No. 2002/0144057 of Li et al. (hereinafter “Li”). These rejections have been carefully considered, but are most respectfully traversed.

The storage control device 1-1 of the invention (for example, the embodiment shown in Figs. 1-3), as now recited in claim 1, comprises: a channel adapter 1-3 which is operatively coupled to a upper device 1-2, provides logical volumes 2-15, 2-16 (Fig. 2) for the upper device 2-15 or 2-16 (called as “upper logical volumes”) and receives data which are sent from the upper device 1-2 to the upper logical volumes 2-15, 2-16, a memory 1-10 which is operatively coupled to the channel adapter 1-3 and stores the data transferred between the upper device 1-2 and the memory 1-10, control information with respect to the data transferred between the upper device 1-2 and the memory 1-10, and configuration information 3-17 (Fig. 3) with respect to the configuration of the storage control device 1-1, a disk adapter 1-7 which controls reading and writing the data, which are sent from the upper device 1-2 to the upper logical volumes 2-15 or 2-16, from and onto the memory 1-10 as being sent to logical volumes 2-13 or 2-14 at least one of which is mapped to one of the upper logical volumes (called as “inner logical volumes”) (Fig. 2; “*The host logical volume 2-15 maps to the internal logical volume 2-13 having an actual memory region for memorizing data.... The data written from the host computer onto the host logical volume are written onto the internal logical volume having the actual memory region according to the mapping between the host logical volume and the internal logical volume.*” p. 14, line 27 to p. 15, line 24; “*imaginary ones not having actual memory regions*” p. 14, lines 19-27) and is used as a storing region for transmission and reception of the data between the channel adapter 1-3 and the disk adapter 1-7, an interconnection device 1-9 which operatively couples

to the channel adapter 1-3, the memory 1-10 and the disk adapter 1-7, and a plurality of disk devices 1-6, which are operatively coupled to the disk adapter 1-7, in which the data for the inner logical volumes 2-13 or 2-14 are written by control of the disk adapter 1-7 as a data group having a redundant relation. A first inner logical volume of the inner logical volumes is mapped to a first upper logical volume of the upper logical volumes (See attached Explanatory Drawing). The channel adapter 1-3 provides a second upper logical volume 3-11 of the upper logical volumes (Fig. 3; p. 16, lines 10-22; *"This host logical volume (for control) 3-11 does not store the data of the application program but is used to control the storage control device 3-1. The term "control" is here understood as signifying the function for reading out the configuration information 3-17 and the function for changing the mapping between the host logical volume and the internal logical volume."* P. 20, 1st paragraph) for control used by the upper device 1-2 to the upper device 1-2, the second upper logical volume 3-11 is utilized when the configuration information 3-17 in the memory 1-10 is read by the upper device 1-2. The channel adapter 1-3 receives a command including a change-over indication from the upper device 1-2 sent for the second upper logical volume 3-11.

The channel adapter 1-3 has a processor 1-12 which maps a second inner logical volume of the inner logical volumes instead of the first inner logical volume to the first upper logical volume 2-15 in response to the change-over indication (p. 24, lines 3-18; p. 27, lines 4-19; *"the configuration of the host logical volume and the mapping of the internal logical volume are modified without varying the configuration of the host logical volume recognized by the host computer at all"* p. 31, line 24 to p. 32, line 13) issued from the upper device 1-2 to the second upper logical volume 3-11 and operates spindle motors of the plurality of disk drives 1-6 on which a data group mapped to the second inner logical volume and having a redundant relation is written.

The invention recited in claim 11 is directed to a method for controlling the storage control device 1-1 recited in claim 1.

The storage system of the invention defines logical volumes for providing for an upper device (for example, a host computer). Such logical volumes are recited as "upper logical volumes" in claim 1, while logical volumes for managing storage areas of a physical storage device (for example, a hard disk drive), are recited as "inner logical volumes" in claim 1. In particular, the relationship between the upper logical volumes and the inner logical volumes is changed in response to a command sent from the upper device. As such, without changing the logical volumes used by the upper device, the storage area for storing

actual data is changed (See the Explanatory Drawing)

Further, a dedicated volume (i.e., the “second upper logical volume” recited in claim 1) in the storage system is used to receive the command from the upper device. The lifetime of the physical storage device is elongated by controlling the activation/deactivation of hard disk drives in response to the changes of the relationship.

In contrast, Pesola merely changes a relation between a logical volume (“virtual volume 320”) of an upper device and a logical volume (“virtual volume 340”) of a physical storage device (Fig. 3B). However, the mapping between the logical volumes is changed only if no access to the physical volume or if a failure occurs caused by a physical or device factor ([0039], [0040] etc.; Fig. 3B), rather than by “any command (“change-over command”) for explicitly changing the “mapping” according to the invention.

In the invention, the storage system user instructs independently to change the mapping freely. Thereby, the physical storage areas of the storage system can be exchanged to use. Accompany with this action, by the controlling the activation/deactivation of the spindle motor of the physical storage device, the long lifetime of the device is achieved.

Kedem merely discloses a general configuration of a storage system but neither teach nor suggest the features of the present invention. Li only discloses some features recited in the dependant claims. Kedem and Li fail to compensate for Pesola’s deficiencies.

Neither Pesola, Kedem, Li, nor their combinations teach or suggest each and every feature of the present invention as recited in independent claims 1 and 11, which other claims depend from. As such, the present invention as now claimed is distinguishable and thereby allowable over the rejections raised in the Office Action. The withdrawal of the outstanding prior art rejections is in order, and is respectfully solicited.

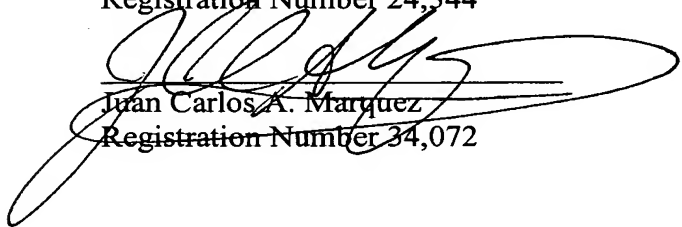
Conclusion

In view of all the above, Applicants respectfully submit that certain clear and distinct differences as discussed exist between the present invention as now claimed and the prior art references upon which the rejections in the Office Action rely. These differences are more than sufficient that the present invention as now claimed would not have been anticipated nor rendered obvious given the prior art. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicant's undersigned representative at the address and phone number indicated below.

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